"The Integration Platform"

- A weak position given the new Windows contract
  - IBM's access to Windows technology ends with what's in process in September 1993
- IBM only has OEM rights to Windows NT
  - They can sell the product or port it to the RS6000
  - They CANNOT incorporate Windows NT technology into OS/2
- IBM has no rights whatsoever to the Win32 API or Win32s

Advantages of Windows NT

Capability

- Security
- Portability to RISC
- Multiprocessor support

IBM can't fix these problems with the existing OS/2 code base

- They must move their customers to a new operating system (Mach?)

Advantages of Windows NT

Seamless Compatibility

- Windows NT seamlessly runs MS-DOS and Windows apps - including Win 3.1
  - One set of printer drivers and fonts
  - One place to configure the system
  - Single command shell runs MS-DOS, Win16, Win32, OS/2, and Posix apps

OS/2 Compatibility
This is Seamless Windows?

- OS/2 is 2 operating systems pasted together
  - 2 sets of printer drivers and fonts
  - 2 places to configure the system
  - Special configuration needed to run Windows apps
  - Separate DOS and OS/2 command prompts

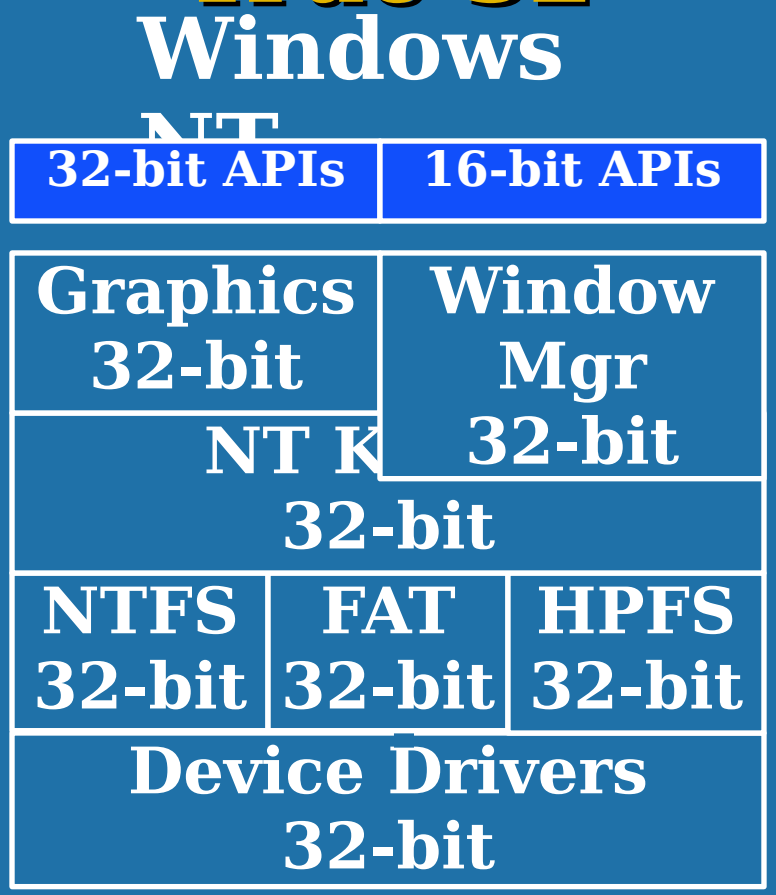
Advantages of Windows NT

Migrating Apps to 32-bit

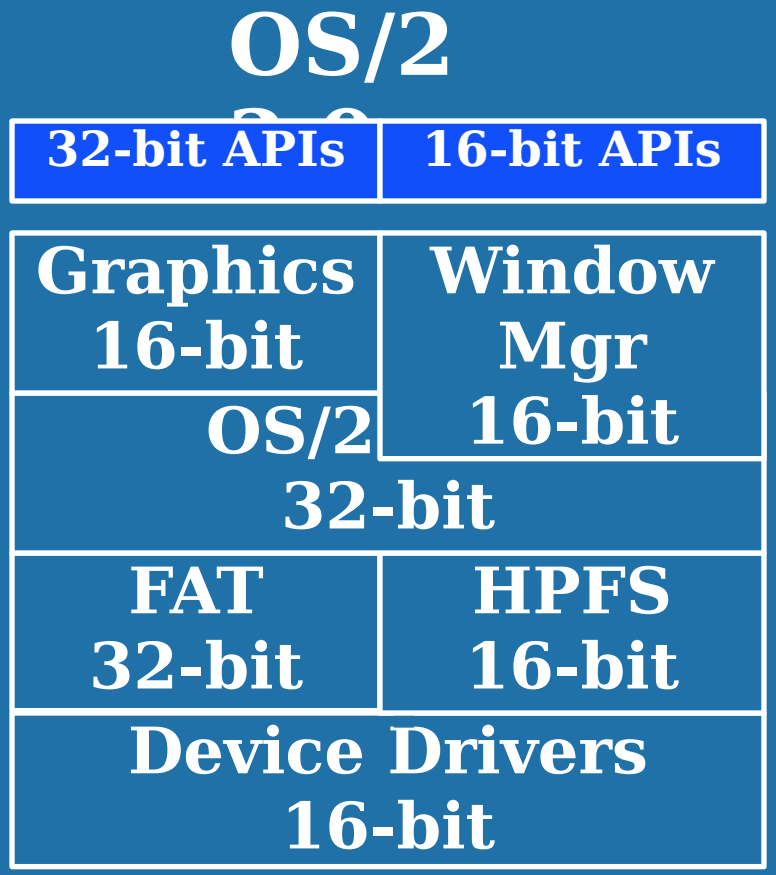
- **Win32 is extremely compatible with Win16**
  - **Apps are easy to port to 32-bit**
  - **Single 16/32-bit source code can be maintained**
  - **It's happening!**
- **Presentation Manager is different in every detail with Win16**
  - **Incredibly difficult to move Windows apps to Presentation Manager**
  - **Very few PM apps (16 or 32-bit)**

Windows NT Architecture

“True 32”



OS/2 2.0 Architecture
“Blue 32”



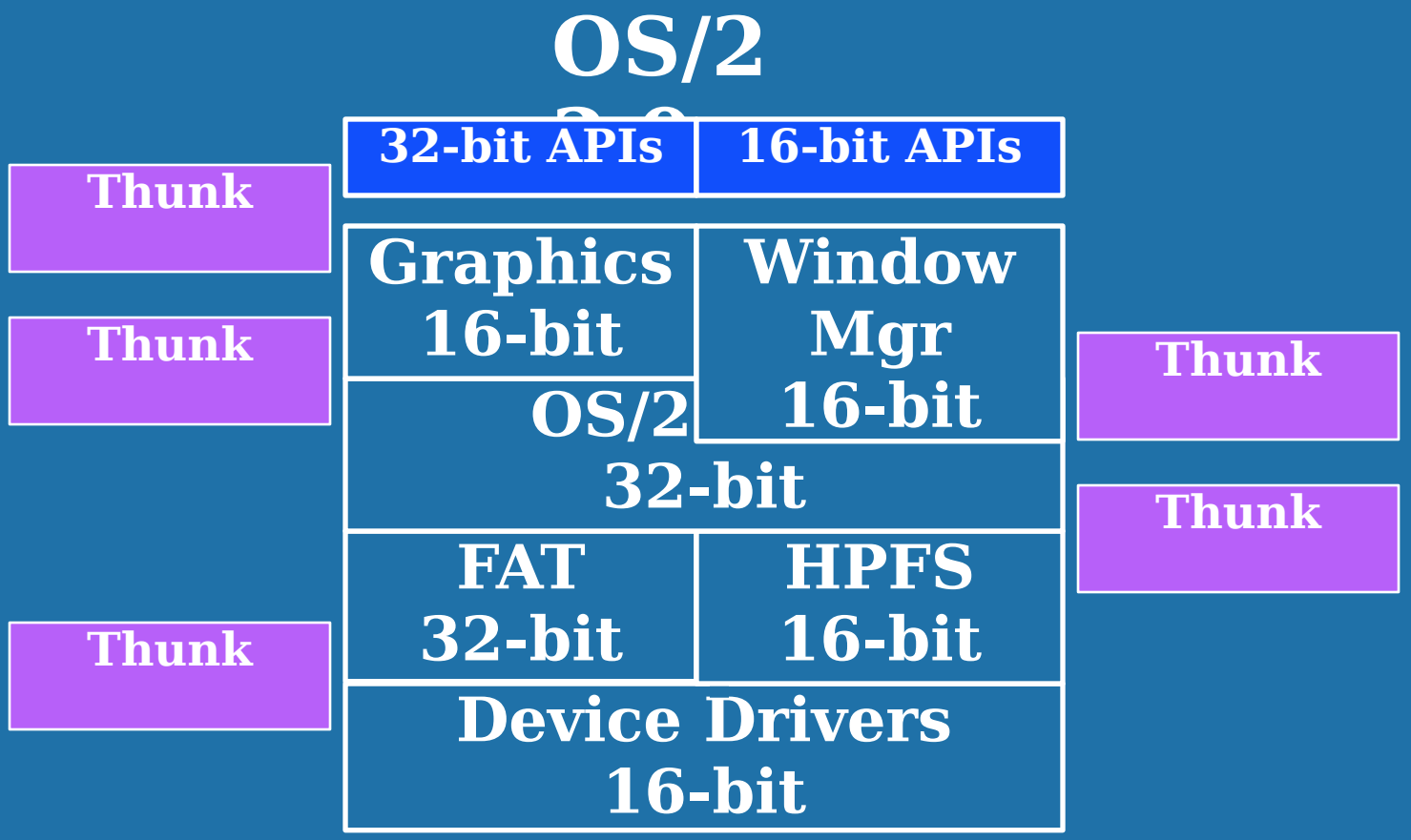
Implications of 16-bit code in 2.0

Thunking

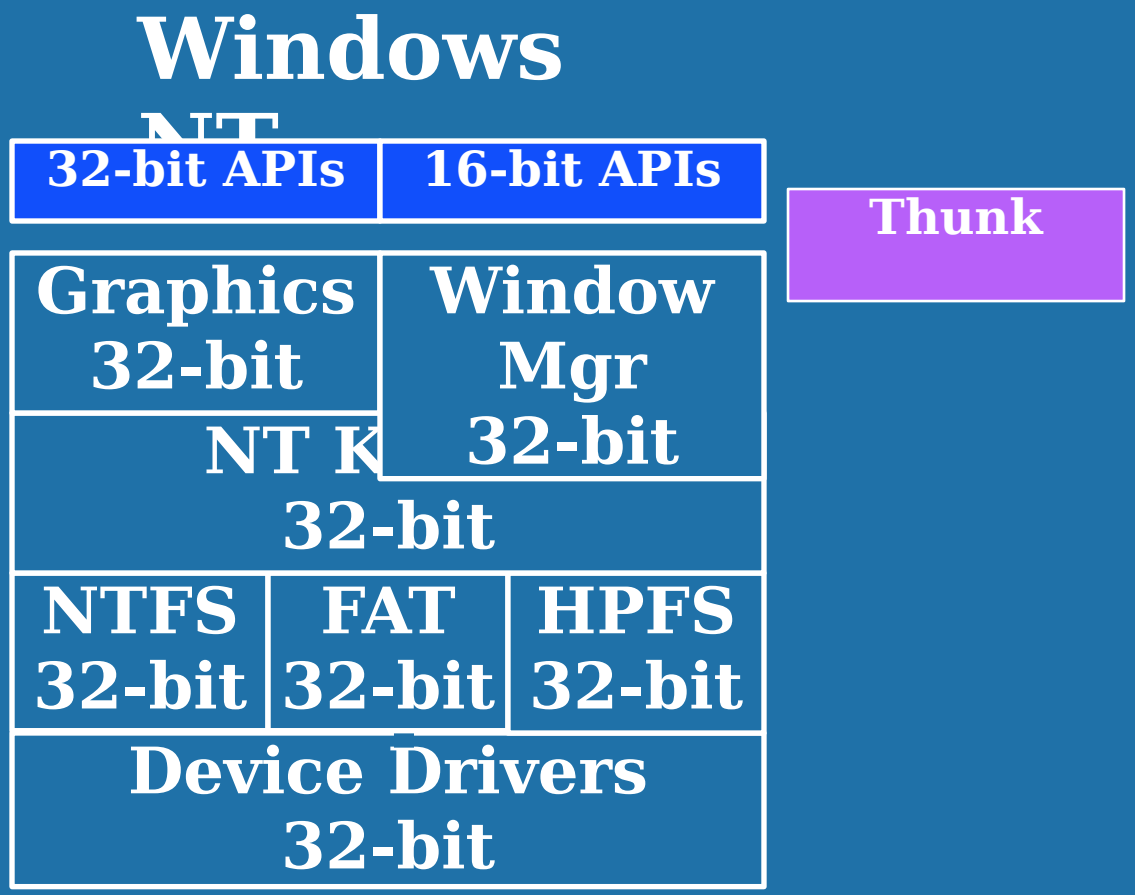
- Thunks convert 16-bit addresses to 32-bit
  - Or 32-bit to 16-bit
- Thunks are pure overhead
- Thunks are required in any OS which supports both 16-bit and 32-bit applications

The less thunks the better!

Thunking in OS/2 2.0



Thunking in Windows NT

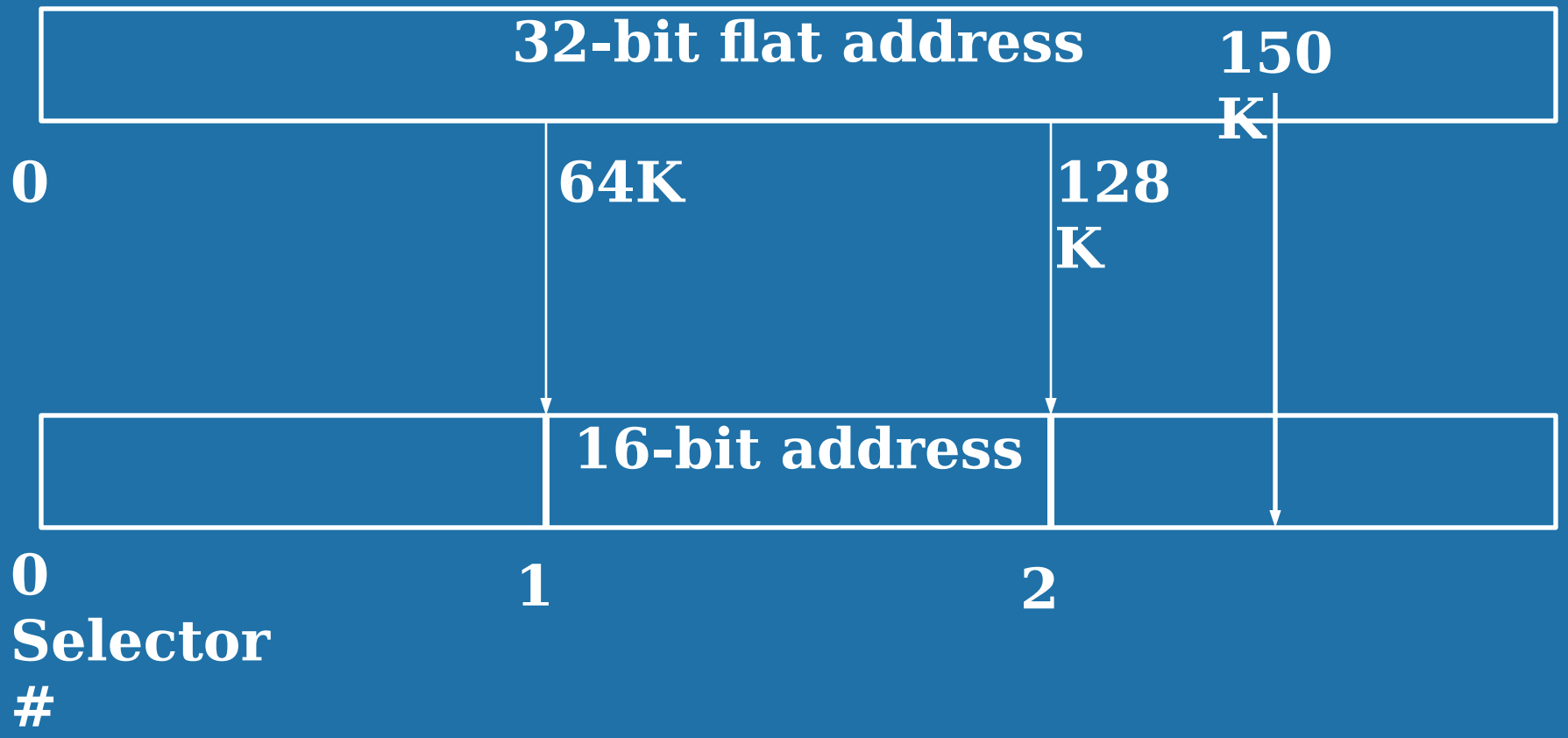


Implications of 16-bit code in 2.0

Tiling

- Fast 16/32-bit address conversion in OS/2 is critical because of all the 16-bit code
- Tiling provides a convenient way to convert 32-bit addresses to 16-bit
  - A 32-bit address is flat - 0:32
  - A 16-bit address contains selectors and offsets - 16:16
- With tiling, each selector begins on a 64K boundary

Tiling in OS/2 2.0



A 32-bit address of 150K = selector 2, offset 22K

Downside of Tiling

- Every data segment begins on a 64K boundary
  - This implies a new 4K page for each data segment
- Most 16-bit applications create lots of small data segments
  - Efficient way to manage memory on a 16-bit OS
- Result: Program bloat thru wasted memory
  - If an app allocates 100 1K segments, OS/2 2.0 wastes 300K

Windows NT does not tile memory

Implications of 16-bit code in 2.0

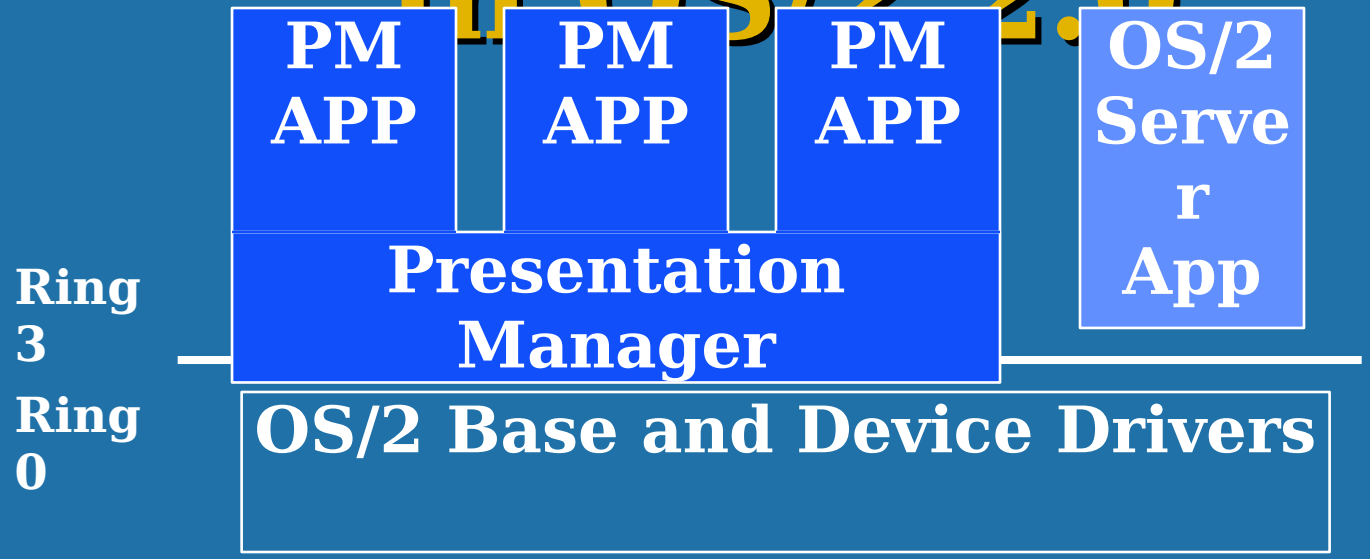
Arbitrary Limits

- Two types of addressing in 16-bit code:
  - Near: 1 data segment (FAST)
  - Far: multiple data segments (SLOWER)
- Near addressing limits data size to 64K
  - This creates a seemingly arbitrary limit

No Limits with Windows NT

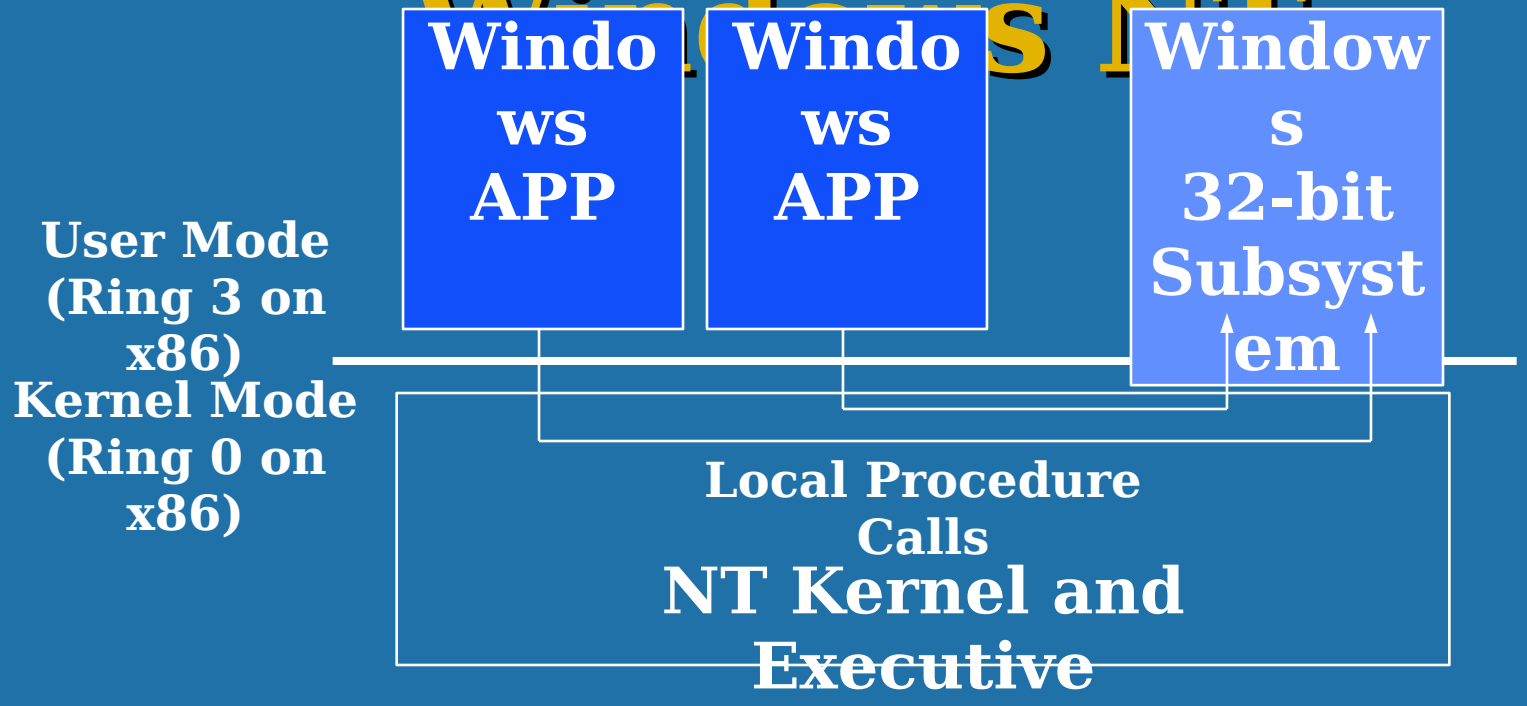
- 32-bit addresses are always near
  - Segment size = 4GB
- 32-bit design of Windows NT eliminates limits with no performance penalty
- Windows NT eliminates limits in other ways:
  - 64-bit volume and file addressing
    - max file size = 20 quintillion bytes

Address Space Separation in OS/2 2.0



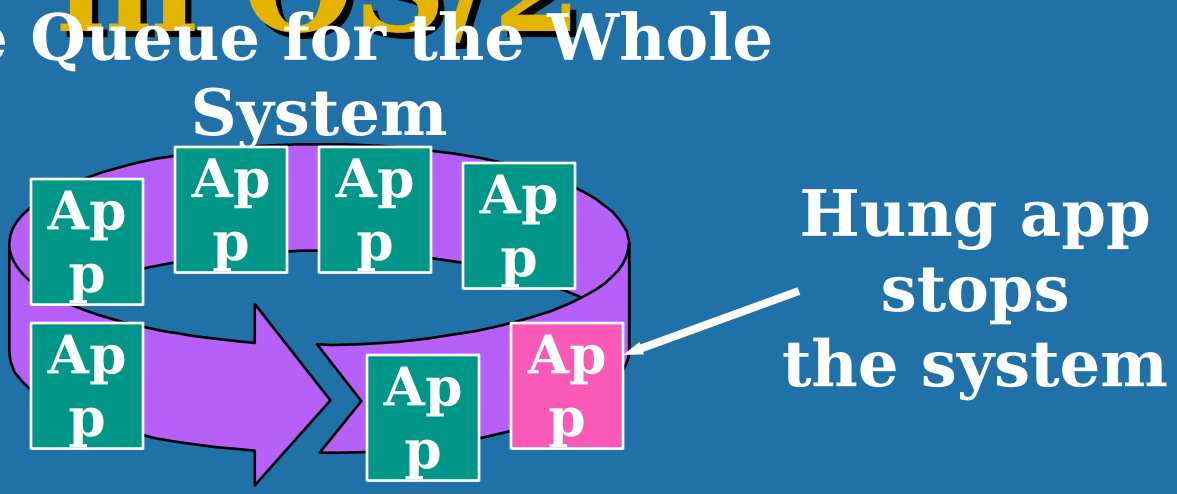
- Character and server apps run in separate address spaces
- PM apps share address space with PM
  - A PM app can corrupt PM and crash

Address Space Separation in Windows NT



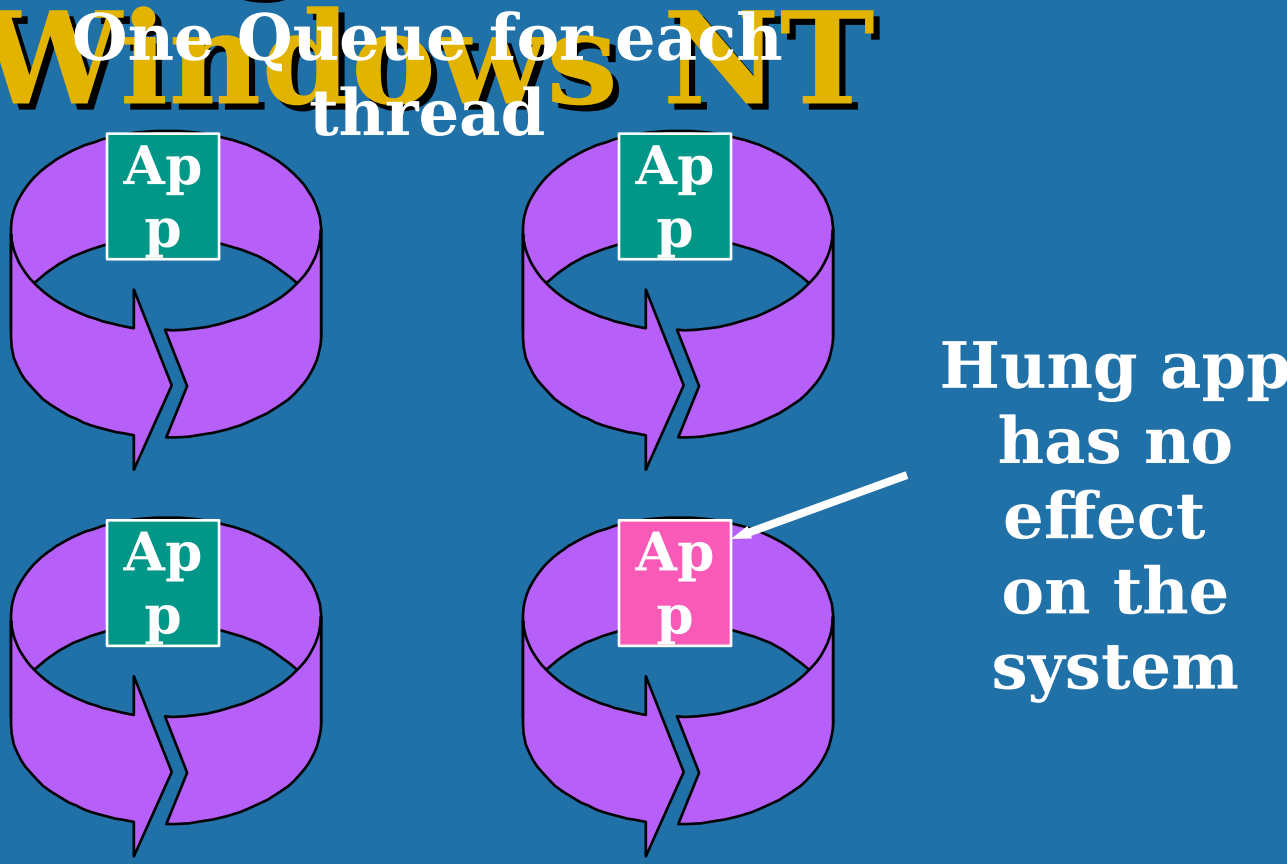
- 32-bit apps run in separate address spaces
  - Can’t crash the system
- Win16 apps run in 1 address space, but they still can’t crash

Single Message Queue in OS/2



- All OS/2 apps share 1 message queue
- If an app hangs, the system is frozen until a timeout expires
  - The user can’t do other work

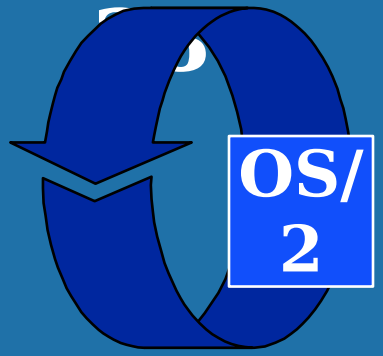
Desynchronized Message Queue in Windows NT



- With Windows NT, it is always possible to switch away from a busy or hung app

Network Server on OS/2 2.0

- IBM has not shipped a high performance Lan Server for OS/2 2.0
  - This requires HPFS 386, which is not yet supported on 2.0
- HPFS 386 bypasses OS/2 scheduling
  - HPFS 386 actually schedules OS/2 as a task



Network Server on Windows NT

- **Built in!**
  - **No connection limits**
- **Uses Windows NT Kernel scheduling**
  - **Basis for multi-processor support**

Other Features in Windows NT

- One button printer setup
- Single user account/password in an enterprise (with Lan Manager)
- FT: Mirroring, striping, striping with parity (with Lan Manager)
- Built-in backup utility
- Performance Monitor
- Unicode
- Configuration Registry...

Summary

- IBM will fight to the death with OS/2
  - Very, very scary
- Windows keeps moving forward
  - ISV support has shifted to Win32
- Windows NT is solid and is available **now** to developers!
- Windows NT blows away OS/2 for corporate computing